PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 281450-00212	FOR FURTHER ACTION	See Form PCT/IPEA/416
International application No. PCT/US04/33290	International filing date *(day/month/year)* 08 October 2004 (08.10.2004)	Priority date *(day/month/year)* 09 October 2003 (09.10.2003)
International Patent Classification (IPC) or national classification and IPC IPC(7): G10H 7/12 and US Cl.: 704/263; 381/61; 84/603		
Applicant TEAC AMERICA, INC.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 10 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 32 sheets, as follows:
      ☐ sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s)) ____ , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☒	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☒	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23 May 2005 (23.05.2005)	20 September 2005 (20.09.2005)
Name and mailing address of the IPEA/ US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Richemond Dorvil Telephone No. (703) 305-3028

Form PCT/IPEA/409 (cover sheet)(April 2005)

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US04/33290

Box No. I Basis of the report

1. With regard to the **language**, this report is based on:

☒ the international application in the language in which it was filed.

☐ a translation of the international application into English, which is the language of a translation furnished for the purposes of:

☐ international search (under Rules 12.3 and 23.1(b))

☐ publication of the international application (under Rule 12.4(a))

☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a))

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:
pages NONE as originally filed/furnished
pages* 1-29 received by this Authority on 23 MAY2005
pages* NONE received by this Authority on

☒ the claims:
pages NONE as originally filed/furnished
pages* NONE as amended (together with any statement) under Article 19
pages* 30-32 received by this Authority on 23 MAY 2005
pages* NONE received by this Authority on

☒ the drawings:
pages 1/13-13/13 as originally filed/furnished
pages* NONE received by this Authority on
pages* NONE received by this Authority on

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages
☐ the claims, Nos.
☐ the drawings, sheets/figs
☐ the sequence listing (*specify*):
☐ any table(s) related to the sequence listing (*specify*):

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US04/33290

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application

☒ claims Nos. 14-21

because:

☐ the said international application, or the said claim Nos. ____ relate to the following subject matter which does not require an international preliminary examination *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. ____ are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. ____ are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no international search report has been established for said claims Nos. 14-21

☐ a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

- ☐ furnish a sequence listing on paper complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ furnish a sequence listing in electronic form complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Preliminary Examining Authority in a form and manner acceptable to it.
- ☐ pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rules 13*ter*.1(a) or (b) and 13*ter*.2.

☐ a meaningful opinion could not be formed without the tables related to the sequence listings; the applicant did not, within the prescribed time limit, furnish such tables in electronic form complying with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions, and such tables were not available to the International Preliminary Examining Authority in a form and manner acceptable to it.

☐ the tables related to the nucleotide and/or amino acid sequence listing, if in electronic form only, do not comply with the technical requirements provided for in Annex C-*bis* of the Administrative Instructions.

☐ See Supplemental Box for further details

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/US04/33290

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 4-10,12 and 13	YES
	Claims 1-3 and 11	NO
Inventive Step (IS)	Claims NONE	YES
	Claims 1-13	NO
Industrial Applicability (IA)	Claims 1-13	YES
	Claims NONE	NO

2. Citations and Explanations (Rule 70.7)
Please See Continuation Sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

On page 1, a paragraph states that this application includes an appendix on compact disc. The Applicant is advised that there is no disc in the ISA file of this International Application. PCT International Application Articles and Rules do not provide for a disc to be included in IPEA files.

Supplemental Box

In case **the space in any of the preceding boxes is not sufficient.**

Continuation of:

Box No. III.
Claims 14-21 were not searched and will not be examined because the invention of claims 14-21 lacks unity of invention with the searched invention. The invention of claims 14-21 does not relate to the same, single, general inventive concept under PCT Rule 13.1 as the invention of claims 1-13, because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: claims 14-21 do not require the particulars of claims 1-13 for patentability, at least because claims 14-21 do not recite the specific convolution of input samples with an impulse response that corresponds to an effect for a portion of a response time and the model for the balance of the response time.

V. 2. Citations and Explanations:

Claims 1-13 meet the criteria set out in PCT Article 33(4), as defined for industrial applicability because the subject matter claimed can be made or used in industry for synthesizing audio.

Fujita

1. Claims 1-3 and 11 lack novelty under PCT Article 33(2) as being anticipated by Fujita et al. [US Patent Application 2003/0169887].

2. Regarding claim 1, Fujita [especially at 0007-0009] describes a synthesizer embodiment by describing the content and functionality of the recited limitations recognizable as a whole to one versed in the art as the following terminology:

an audio stream [at 0005, as an analog signal waveform of a sound to be processed];

the stream representing an audio performance [being received audio, the input must necessarily have been performed as audio, and inherently represents that audio performance];

the stream including samples [at 0005, as samples of the waveform];

the samples are at a sample rate [being samples of a stream, the samples must necessarily have discrete time values, and discrete time values inherently define the rate];

data representing an impulse response [at 0008, as data of an impulse response waveform];

the impulse response corresponds to an acoustic effect [at 0004, as the impulse response provides effects of reflection sound and reverberant sound];

an output audio stream [at 0002, as a provided acoustic signal];

the output stream based on the input stream by convolving it [at 0002-0004, as the provided acoustic signal from

convoluting the acoustic signal];
the output based on the impulse response by convolving it [at 0002-0004, as the provided acoustic signal from convoluting the impulse response waveform];
the basis is convolving [at 0002-0004, as the provided acoustic signal from convoluting];
a portion of a response time is convolved [at 0008-0009, as using only an initial part of the impulse response waveform performs a convolution];
the balance of the response time models an output [at 0009, as for the succeeding reverberant sound artificially produce a late acoustic signal for succeeding reverberant sound independently of the impulse response];
the output modeled is an output audio system [at 0004, as provide the effect of sounds as if observed in a church acoustic space];
means for receiving the audio as input [see Fig. 1, item 10 and at 0005, as apparatus samples an analog signal waveform of a sound to be processed];
means for receiving the impulse data [see Fig. 1, item 10 and at 0004, as apparatus that records an impulse response waveform];
means for generating the output [see Fig. 1, items 108, 30, 40, and at 0002, as the invention providing an acoustic signal with an effect]; and
generating during the response time [at 0009, as connect the acoustic signal of the initial sound with the artificial signal of the succeeding sound].
Fujita also describes a modification with:
modeling the output audio system [at 0131, as user-simulated waveform for any acoustic space].

3. Regarding claim 2, Fujita also describes:
means for receiving from a user an indication of the acoustic effect [at 0135, as the operation section with a user operation allowing selection of reverberation data associated with acoustic spaces].

4. Regarding claim 3, Fujita also describes:
the effect comprises an acoustic modification of the audio performance [at 0004-0005, as provide effect of reflection sound and reverberant sound converting the analog signal of the sound to be processed].

5. Regarding claim 11, Fujita also describes:
recursively extrapolating a tail portions of the audio output stream [at 0022-0023, as generate a last acoustic signal (in second operating section) and recursively attenuate the (late) signal obtained by the second operating section].

Fujita and Orduña-Bustamante

6. Claims 4, 5, 7-10, 12, and 13 lack an inventive step under PCT Article 33(3) as being obvious over Fujita et al. [US Patent Application 2003/0169887] in view of Orduña-Bustamante et al. [US Patent 5,862,227].

7. Regarding claim 4, Fujita describes the included claim elements as indicated elsewhere in this Office action, including the audio input samples and an input channel.
However, Fujita does not explicitly describe a plurality of input channels.
Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an (listening-room) effect, and Orduña-Bustamante describes:
a plurality of input samples for each of a plurality of input channels [see Fig. 3, items $u_1(n)$ and $u_2(n)$ and their description especially at column 4, lines 17, as discrete time signal];
the stream and samples are audio [at column 1, lines 14-24, as sound signal].
Like Fujita, Orduña-Bustamante [at Fig. 1] gives a description of the processing for a single channel; however, Orduña-Bustamante's goal is multichannel audio. As indicated, Orduña-Bustamante shows that audio input samples for each channel of a plurality of channels were known to artisans at the time of invention. Since Orduña-Bustamante [at column 1, lines 25-50] also points out that the processing has the advantage of matching the characteristics of a desired multichannel signal, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Orduña-Bustamante at least plural input audio channels with Fujita's input channel because the processing could then produce the desired effect for multichannel input of an audio performance.

8. Regarding claim 5, Fujita describes the included claim elements as indicated elsewhere in this Office action.
However, Fujita does not explicitly describe a plurality of output channels.
Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an

(listening-room) effect, and Orduña-Bustamante describes:

a plurality of output channels [see Fig. 4, items Sources and their description especially at column 3, line 21, as the pair of sound sources].

Like Fujita, Orduña-Bustamante [at Fig. 1] gives a description of the processing for a single channel; however, Orduña-Bustamante's goal is multichannel audio. As indicated, Orduña-Bustamante shows that multiple audio output channels were known to artisans at the time of invention. Since Orduña-Bustamante [at column 1, lines 25-50] also points out that the processing has the advantage of matching the characteristics of a desired multichannel signal, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Orduña-Bustamante at least plural output audio channels with Fujita's output channel because the processing could then produce the desired effect for multichannel output of an audio performance.

9. Regarding claim 7, Fujita describes the included claim elements as indicated elsewhere in this Office action.

However, Fujita does not explicitly describe recording the audio performance using a particular microphone placement.

Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an (listening-room) effect, and Orduña-Bustamante describes:

recording the audio [at column 4, lines 60-65, as the processing produces recordings];

simulating a particular microphone placement [at column 12, lines 60-67, as produce the illusion that the sound source is located in a given spatial position].

the audio representing an audio performance [being received audio, the input must necessarily have been performed as audio and represents that audio performance].

Like Fujita, Orduña-Bustamante [at Fig. 1] gives a description of the processing for a single channel; however, Orduña-Bustamante's goal is multichannel audio. As indicated, Orduña-Bustamante shows that simulating recording of a particular microphone placement was known to artisans at the time of invention. Since Orduña-Bustamante [at column 13, lines 1-21] also points out that the processing has the advantage of producing the stereophonic illusion, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Orduña-Bustamante at least simulating a particular microphone placement with Fujita's processing because the processing could then produce the desired effect of stereophonic illusion of an audio performance.

10. Regarding claim 8, Fujita describes the included claim elements as indicated elsewhere in this Office action. Fujita also describes:

simulating in a particular musical context [at 0004, as provide the effect of sounds as if observed in a church acoustic space].

However, Fujita does not explicitly describe recording the simulated audio performance.

Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an (listening-room) effect, and Orduña-Bustamante describes:

recording the simulated audio [at column 5, lines 1-4, as enabling recorded signals $v_1(n)$ and $v_2(n)$ of the virtual source];

the audio representing an audio performance [being received audio, the input must necessarily have been performed as audio and represents that audio performance].

Like Fujita, Orduña-Bustamante [at Fig. 1] gives a description of the processing for a single channel; however, Orduña-Bustamante's goal is multichannel audio. As indicated, Orduña-Bustamante shows that simulating recording of a particular virtual signal was known to artisans at the time of invention. Since Orduña-Bustamante [at column 5, lines 1-4] also points out that the processing has the advantage of producing the stereophonic illusion ready for later reproduction by two loudspeakers, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Orduña-Bustamante at least simulating recording of the particular virtual signal with Fujita's generated signal effects because the processing could then produce the desired effect ready for reproduction by a loudspeaker.

11. Regarding claim 9, Fujita describes the included claim elements as indicated elsewhere in this Office action.

However, Fujita does not explicitly describe simulating playing using a particular instrument body.

Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an (listening-room) effect, and Orduña-Bustamante describes:

simulating playing using a particular instrument body [at column 2, lines 64-65, as virtual source locations for reproduction can be attributed to (a) different instrument(s)];

the audio representing an audio performance [being received audio, the input must necessarily have been performed as audio and represents that audio performance].

Like Fujita, Orduña-Bustamante [at Fig. 1] gives a description of the processing for a single channel; however, Orduña-Bustamante's goal is multichannel audio. As indicated, Orduña-Bustamante shows that simulating recording of a particular instrument attributed to a location was known to artisans at the time of invention. Since Orduña-Bustamante [at column 5, lines 1-4] also points out that the processing has the advantage of producing the stereophonic illusion ready for later reproduction by two loudspeakers, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Orduña-Bustamante at least simulating recording of the particular instrument at a location with Fujita's generated signal effects because the processing could then produce the effect of a particular instrument body at a desired location.

12. Regarding claim 10, Fujita describes the included claim elements as indicated elsewhere in this Office action.

However, Fujita does not explicitly describe simulating playing using a particular instrument placement.

Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an (listening-room) effect, and Orduña-Bustamante describes:

simulating playing using a particular instrument placement [at column 2, lines 64-65, as virtual source locations for reproduction can be attributed to (a) different instrument(s)];

the audio representing an audio performance [being received audio, the input must necessarily have been performed as audio and represents that audio performance].

Like Fujita, Orduña-Bustamante [at Fig. 1] gives a description of the processing for a single channel; however, Orduña-Bustamante's goal is multichannel audio. As indicated, Orduña-Bustamante shows that simulating recording of a particular instrument attributed to a location was known to artisans at the time of invention. Since Orduña-Bustamante [at column 5, lines 1-4] also points out that the processing has the advantage of producing the stereophonic illusion ready for later reproduction by two loudspeakers, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Orduña-Bustamante at least simulating recording of the particular instrument at a location with Fujita's generated signal effects because the processing could then produce the effect of a particular instrument body at a desired location.

13. Regarding claim 12, Fujita describes the included claim elements as indicated elsewhere in this Office action. Fujita also describes:

a first number of source channels [see Fig. 1, items 10, 104, and their descriptions, especially at 0002, of a provided acoustic signal].

However, Fujita does not explicitly describe a number of output channels greater than the number of source channels.

Like Fujita, Orduña-Bustamante [at column 1, lines 33-50] describes providing an acoustic signal with an (listening-room) effect, and Orduña-Bustamante describes:

a number of source channels [see Fig. 1, items u(n), Virtual Source, and their description especially at column 4, lines 17, of (the one) signal u(n) defining a source];

a number of output channels greater than the number of source channels [see Fig. 1, items $u_1(n)$, $u_2(n)$, Real Sources and their description especially at column 3, line 21, as the pair of sound sources].

Like Fujita, Ito [at Fig. 1] gives a description of the processing for a single channel; however, Ito's goal is multichannel audio. As indicated, Fujita shows that multiple audio output channels and a single input channel were known to artisans at the time of invention. Since Ito [at column 1, lines 44-50] also points out that the processing has the advantage of providing the illusion that the source input on the channel is coming from a desired position, perhaps remote for the loudspeakers reproducing the source audio, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Ito at least more output audio channels than input audio channels with Fujita's input channel because the processing could then produce the desired illusion of locating the apparent source of audio away from the loudspeakers.

14. Regarding claim 13, Fujita also describes:

only a single source channel [see Fig. 1, items 10, 104, and their descriptions, especially at 0002, of a provided acoustic signal].

In addition, Orduña-Bustamante also describes the embodiment with:

only a single source channel [see Fig. 1, items u(n), Virtual Source, and their description especially at column 4, lines 17, of (the one) signal u(n) defining a source];

a simulated version of the single source channel [see Fig. 1, items $u_1(n)$, $u_2(n)$, Virtual Source and its description

especially at column 4, lines 18-21, as the "virtual source signal" attributed to a source at an arbitrary location];

the simulated version is stereo [at column 12, line 58-column 13, line 1, as the illusion that a sound source is located in a given spatial position form the basis of conventional stereophonic].

Fujita and Ito

15. Claim 6 lacks an inventive step under PCT Article 33(3) as being obvious over Fujita et al. [US Patent Application 2003/0169887] in view of Ito [US Patent 6,453,253].

16. Regarding claim 6, Fujita describes the included claim elements as indicated elsewhere in this Office action.

However, Fujita does not explicitly describe recording the audio performance simulating a particular microphone.

Like Fujita, Ito [at Fig. 2] describes providing a received acoustic signal with a room (chamber) effect, and Ito describes:

recording the audio [at column 3, lines 50-56, as recorded sounds to be reproduced in an anechoic chamber];

simulating a particular microphone [at column 3, lines 46-54, as provide an impulse response correction of the characteristic of the microphone to a desired (microphone) one];

the audio representing an audio performance [see Fig. 2, items 12, 16, MEASURED SOUNDS, and their description especially at column 5, lines 62-67, of sounds representing the production result of a sound source].

Like Fujita, Ito [at columns 5-6] gives a description of impulse response measuring and processing for simulating acoustic effects. As indicated, Ito shows that recording an audio performance simulating a particular microphone was known to artisans at the time of invention. Since Ito [at column 3, lines 46-48] also points out that the processing has the advantage of matching the characteristics of a desired microphone characteristics, it would have been obvious to one of ordinary skill in the art of audio reproduction at the time of invention to include the concepts described by Ito at least simulating particular microphone characteristics with Fujita's impulse response simulation processing because the processing could then produce the effect of using a desired microphone of an audio performance.